



Implications of the Decadal Review for Hydrology

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Department of Civil and Environmental Engineering
University of Washington

for presentation at

workshop on

Satellite Observations of the Global Water Cycle

Irvine, CA

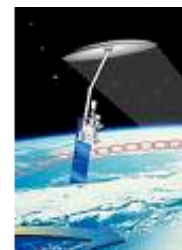
March 9, 2007

Mission Ranking	Parameters Measured	RFI Source Mission(s)	Mission Concept Name
1	Surface Freeze/Thaw Soil Moisture	Hydros, WOWS, MOSS	Soil moisture and freeze/thaw
2	River and Lake Elevation Ocean Circulation	WaTER Hydrosphere Mapper or OOLM	Swath altimetry
3	Snow Water Equivalent	CLPP	Cold land processes
4	Water Vapor Wind Speed and Direction	AIRS, GPS RO WOWS	Water vapor transport
5	Sea-Ice Thickness, Glacier Surface Elevation Glacier Velocity	ICESAT++ InSAR	Sea ice and glacier mass balance
6	Ground Water Glacier Mass Balance Ocean Mass Distribution	GRACE follow-on, ICESat++	Groundwater and ocean mass
7	Inland and Coastal Water Quality	FLORA, SAVII	Inland and coastal water quality

Soil Moisture Active-Passive (SMAP)

Launch: 2010-2013

Mission Size: Medium



Soil freeze/
thaw state



Soil moisture
effect on
vegetation



Linkage between
terrestrial water,
energy, and
carbon cycle



Drought early
warning and
decision support



Predictions of
agricultural
productivity

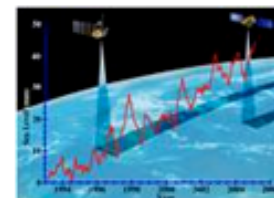


More accurate,
longer-term
weather forecasts

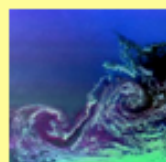
Surface Water and Ocean Topography (SWOT)

Launch: 2013-2016

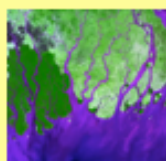
Mission Size: Medium



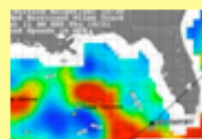
Lake, wetland, and reservoir storage



Ocean eddies and currents



River discharge estimates



Sea level measurements extended into coastal zones



Flood forecasts



Marine forecasts



Inundation and malaria zone identification and forecasts

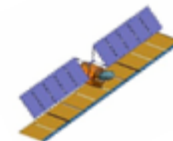


Prediction of changes in sea level

Snow and Cold Land Processes (SCLP)

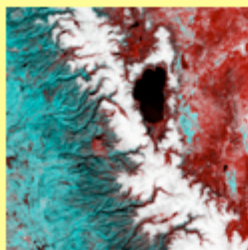
Launch: 2016-2020

Mission Size: Medium



Snow pack
accumulation and
Snowmelt extent

Snow water
equivalent, snow
depth, and snow
wetness



Dynamics of
water storage in
seasonal snow
packs



Assessment of risk
of snowmelt-
induced floods and
debris flows



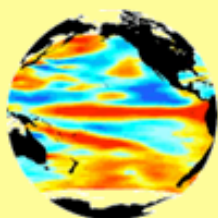
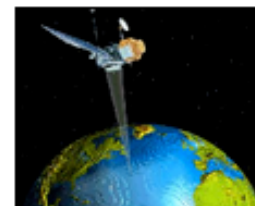
Impact of climate
change on seasonal
snow packs



Informed
freshwater
resource
management

Precipitation and All-weather Temperature and Humidity (PATH)

Launch: 2016-2020
Mission Size: Medium



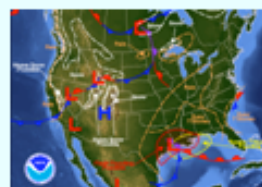
Sea surface
temperature



Temperature and
humidity profiles



Constraints on
models for boundary
layer, cloud, and
precipitation
processes



More accurate,
longer-term weather
forecasts

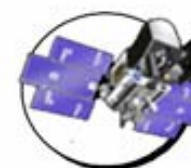


Improved storm track
and intensification
prediction and
evacuation planning



Determination of
geographic
distribution and
magnitude of storm
surge and rain
accumulation

ICESat-II
Launch: 2010-2013
Mission Size: Medium



Ice sheet
thickness and
volume



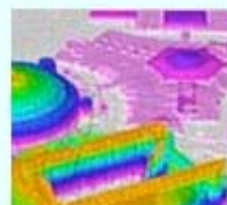
Vegetation
canopy depth as
an estimate of
biomass



Estimate of flux
of low-salinity
ice out of Arctic
basin



Changes in volume
of ice sheets in
response to climate
change

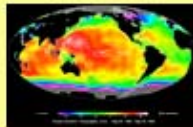
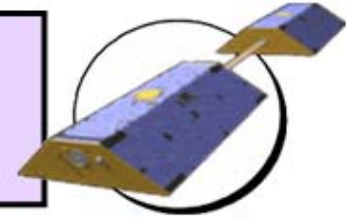


Effects of
changing climate
and land use on
level of CO₂ in
atmosphere



Prediction of
changes in sea
level

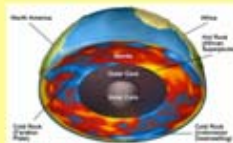
GRACE-II
Launch: 2016-2020
Mission Size: Medium



Changes in aquifers
and deep ocean
currents



Ice sheet mass,
volume, and
distribution



Changes in Earth's
mass distribution due
to dynamic
processes



Changes in volume
of ice sheets in
response to climate
change



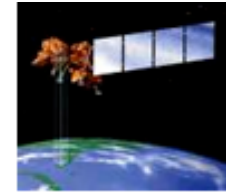
Improved
groundwater
management



Prediction of
changes in sea
level

Hyperspectral Infrared Imager (HyspIRI)

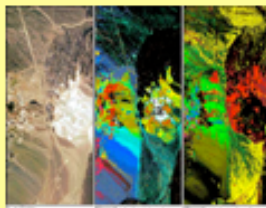
Launch: 2013-2016
Mission Size: Medium



Processes indicating volcanic eruption



Nutrients and water status of vegetation, soil type and health



Spectra to identify locations of natural resources



Changes in vegetation type and deforestation; drought early warning



Improved exploration for natural resources



Forecast likelihood of volcanic eruptions, and landslides

The NASA Response to the Decadal Review

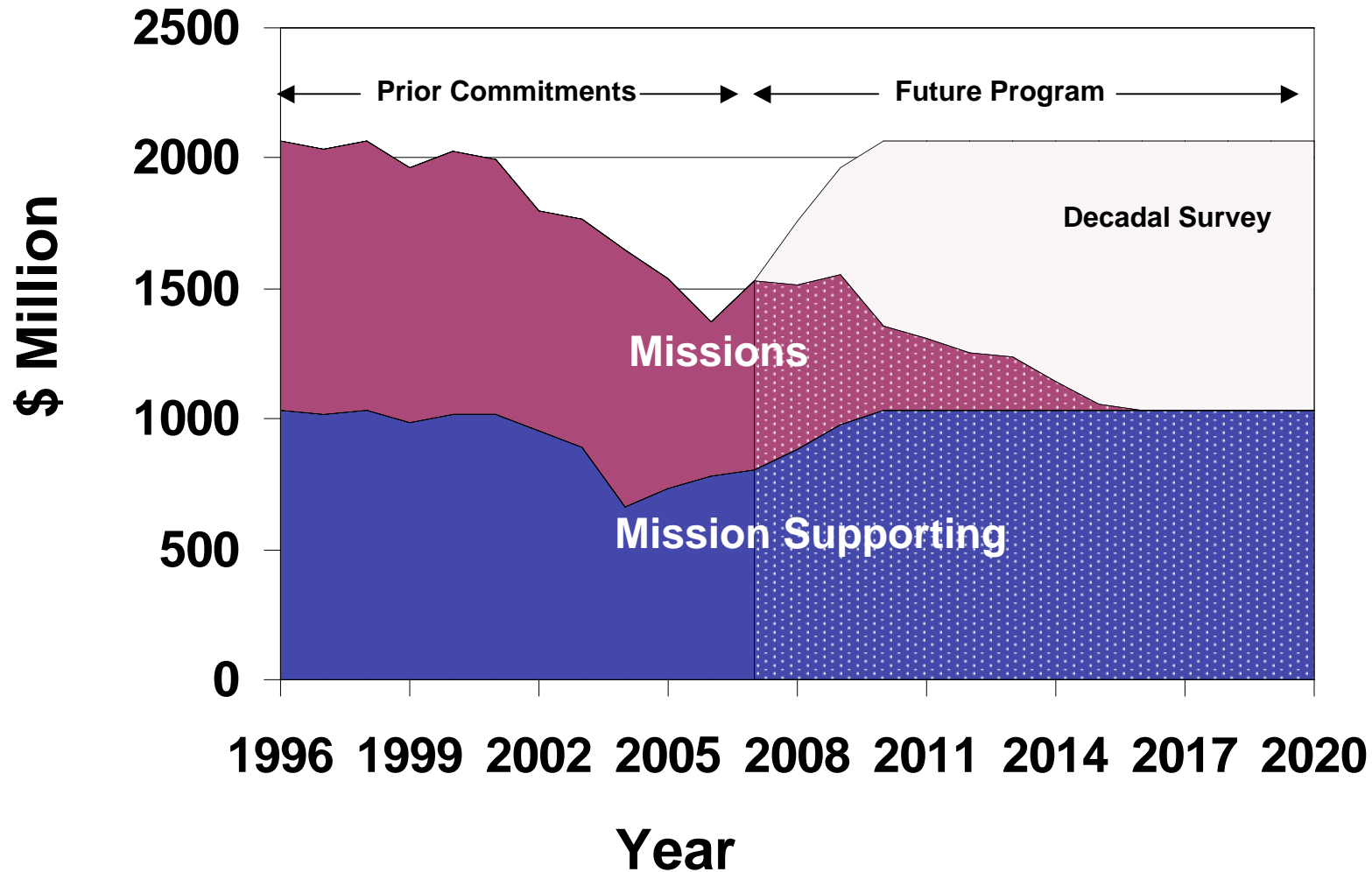
(Budget authority, \$ in millions)						
By Appropriation Account						
By Mission Directorate	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
By Theme						
Science, Aeronautics and Exploration	10,650.6	10,483.1	10,868.4	11,364.2	15,386.5	15,888.6
<u>Science</u>	<u>5,466.8</u>	<u>5,516.1</u>	<u>5,555.3</u>	<u>5,600.6</u>	<u>5,656.9</u>	<u>5,802.7</u>
Earth Science	1,464.5	1,497.3	1,545.8	1,520.1	1,411.2	1,353.2
Heliophysics	1,028.1	1,057.2	1,028.4	1,091.3	1,241.2	1,307.5
Planetary Science	1,411.2	1,395.8	1,676.9	1,720.3	1,738.3	1,748.2
Astrophysics	1,563.0	1,565.8	1,304.2	1,268.9	1,266.2	1,393.8
<u>Exploration Systems</u>	<u>4,152.5</u>	<u>3,923.8</u>	<u>4,312.8</u>	<u>4,757.8</u>	<u>8,725.2</u>	<u>9,076.8</u>
Constellation Systems	3,232.5	3,068.0	3,451.2	3,784.9	7,666.0	7,993.0
Advanced Capabilities	920.0	855.8	861.6	973.0	1,059.1	1,083.9
<u>Aeronautics Research</u>	<u>529.3</u>	<u>554.0</u>	<u>546.7</u>	<u>545.3</u>	<u>549.8</u>	<u>554.7</u>
Aeronautics Technology	529.3	554.0	546.7	545.3	549.8	554.7
<u>Cross-Agency Support Programs</u>	<u>502.0</u>	<u>489.2</u>	<u>453.5</u>	<u>460.4</u>	<u>454.7</u>	<u>454.4</u>
Education	167.4	153.7	152.8	152.7	149.8	149.6
Advanced Business Systems	97.4	103.1	69.4	71.6	67.6	67.5
Innovative Partnerships Program	215.1	198.1	197.2	199.8	200.0	200.0
Shared Capability Assets Program	22.1	34.3	34.2	36.2	37.3	37.2
Continuing Resolution Rate*	(555.60)					
Exploration Capabilities	6,108.3	6,791.7	6,710.3	6,625.7	3,036.6	2,978.0
<u>Space Operations</u>	<u>6,108.3</u>	<u>6,791.7</u>	<u>6,710.3</u>	<u>6,625.7</u>	<u>3,036.6</u>	<u>2,978.0</u>
Space Shuttle	4,017.6	4,007.5	3,650.9	3,634.4	116.2	0.0
International Space Station	1,762.6	2,238.6	2,515.1	2,609.2	2,547.5	2,600.8
Space and Flight Support	328.1	545.7	544.3	382.0	372.9	377.2
Continuing Resolution Rate*	(40.9)					
Inspector General	33.5	34.6	35.5	36.4	37.3	38.3
Continuing Resolution Rate*	(2.0)					
TOTAL	16,792.3	17,309.4	17,614.2	18,026.3	18,460.4	18,905.0
Year to Year Change		3.1%	1.8%	2.3%	2.4%	2.4%

FY 2007 column represents the 2007 President's Budget in full-cost simplification and shown in the new Theme structure.

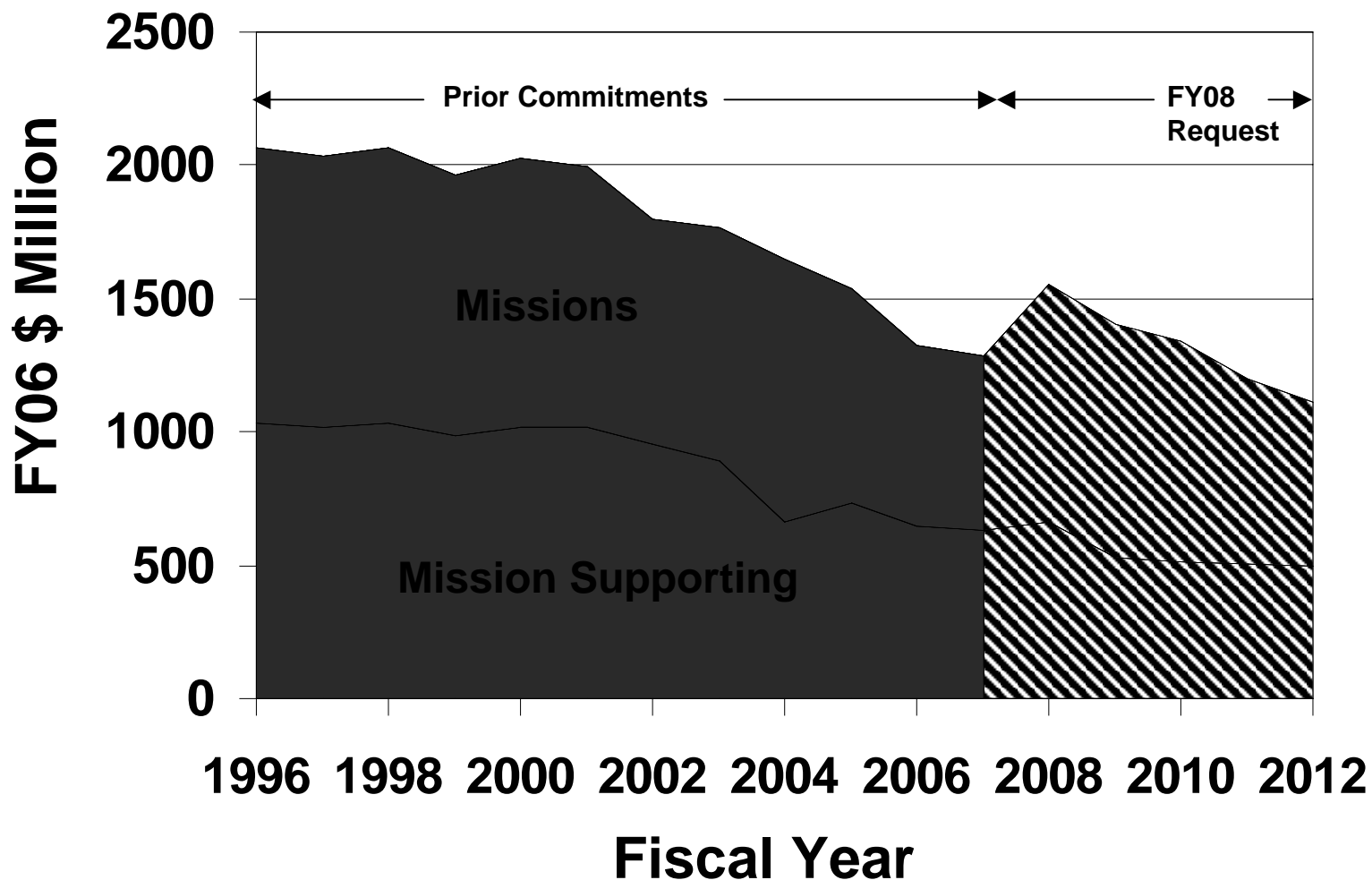
* Modification to FY 2007 if current continuing resolution is extended for entire year, and assuming \$126.1M institutional mission support transfers from Exploration Capabilities to Science, Aeronautics and Exploration. Not included in totals.

Totals may not add due to rounding.

NASA Earth Science Program: Rapid Return to 2000 Funding Levels



NASA Earth Science Program: A Substantial Funding Decline



So what is the solution

- a) Testimony to key congressional committees (much of this has already happened)
- b) University (and other non-governmental) interaction with federal affairs offices/representatives
 - Most university researchers don't know these people
 - Need to convey information in a concise "USA Today" form
- c) Proposed statement from AGU (discussions underway)
- d) White paper or other response (including position statement) from this meeting
- e) Concerted action among key universities – possible meeting with congressional staff

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U.S. Constitution, Article I, Section 9, Clause 7

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03/06/07

Hearing - Commerce, Justice, Science

Department of Commerce

Andrew Reamer, Fellow, Brookings Institution

Marsha Schachtel, Senior Fellow, Johns

Hopkins Institute for Policy Studies

10:00 AM, H-309, The Capitol

03/06/07

Hearing - Commerce, Justice, Science

Department of Commerce

Carlos M. Gutierrez, Secretary, Department of Commerce

2:00 PM, 2359 Rayburn

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Commission on Civil Rights

AGU position statement on NASA earth and space sciences (May 2005)

“AGU calls for the U.S. Administration, Congress, and NASA to continue their commitment to innovative Earth and space science programs. This commitment has placed the U.S. in an international leadership position .. it is, however, threatened by financial demands placed on NASA by ... the space shuttle, space station, and the Moon-Mars initiative.

... Earth and space sciences have become a lower priority at NASA. NASA's proposed 2006 budget reduces science research by \$1.2 billion over the next five years ... These cuts will decimate effective programs These losses will degrade our weather forecasting, search and rescue, and life and property protection capabilities ...

NASA is being asked to do more than it can with the resources provided. Shifting financial resources from science threatens vital investments and capabilities AGU asks the U.S. Administration, Congress, and NASA to renew their commitment to Earth and space science research.”